LITERATURE SURVEY

2.1 DEVELOPMENT OF A SMART TRAFFIC LIGHT CONTROL SYSTEM WITH REAL-TIME MONITORING

Traffic signal management programmes have routinely utilised to observe and manage the flow of cars since they first appeared. Nonetheless, metropolitan centres are populating more and more due to the rise in the number of private and public transportation options (bus, automobile, motorcycle, and truck). Such a phenomena increases environmental and noise pollution as well as transportation congestion. Large cities are using technological solutions to address these issues, bringing the idea of "smart cities" to life. Many hardware and software solutions have been researched and put into practise all around the world while keeping an eye on traffic control systems themselves. By creating a centralised Using a specialised wireless communication network and a traffic light management system, the author of this essay hopes to improve traffic lights. The most frequent kinds of urban junctions were examined to demonstrate the system's efficacy. To provide a complete set of controls for anomalous events, such as stopping roads due to accidents or public gatherings, direct control procedures for network traffic lights were built. Eventually, safety procedures were developed to inform central management of the traffic light system bulbs' operational condition. It was feasible to make up an operational using a logic analyser connected to the outputs for each focus group, create an operational phases timing diagram for each traffic light. Consequently, parallels between theoretical and real timing diagrams were used to validate the system.

2.2 SMART CONTROL OF TRAFFIC LIGHT USING ARTIFICIAL INTELLIGENCE

Traffic congestion is one of the most urgent issues due to a growth in both the population and the usage of cars in cities. Traffic jams not only prolong commute times and raise stress levels for drivers, but they also considerably increase air pollution and fuel consumption. While appearing to be everywhere, it has the greatest influence on megacities. Due to the ever-increasing nature of road traffic, it is also crucial to estimate the road traffic density in real-time for enhanced signal control and effective traffic management. One of the important elements influencing traffic flow is the traffic controller. As a result, it becomes necessary to optimize traffic management to better meet this rising demand. Our suggested method intends to use real-time photos from the cameras at traffic intersections for image processing and AI-based traffic density estimation. It also focuses on the algorithm for changing traffic signals depending on vehicle density in order to relieve congestion, speed up travel for commuters, and lessen pollution.

2.3 A REAL-TIME DENSITY-BASED TRAFFIC SIGNAL CONTROL SYSTEM

Accidents and traffic congestion are becoming two of the biggest problems in Sri Lanka. Many social, economic, and environmental challenges result from these issues. One of the causes is a lack of an efficient traffic light control system. This study suggested a method for creating a real-time traffic signal based on density management system. The two main components of this study are an ANN model for real-time data prediction and a real-time data collection paradigm for image processing. In order to reduce the dimensionality of the features and find the best features from the acquired data, principal component analysis (PCA) is used to train neural network models. Lanes are monitored and photographed using cameras. The number of vehicles in each lane and the duration of the queue are identified and counted using image processing. The data from each lane is sent to the ANN unit. Based on the amount of automobiles, the trained model will decide what lanes and time restrictions are necessary to enable the green phase. The NN model's accuracy during training was 0.9274. The traffic lights at the intersections will have changed independently and dynamically in line with the conditions of real-time traffic when using this traffic light control system instead of the present fixed time traffic light control system or traditional computer approaches. This method reduces the typical waiting time while increasing the effectiveness of the traffic flow. New adaptive traffic management also lessens pollution brought on by CO_2 emissions as well as social and economic issues.

2.4 ADAPTIVE TRAFFIC LIGHT CONTROLLER SIMULATION FOR TRAFFIC

The control of traffic lights becomes more significant as the number of cars rises in densely populated places. Using adaptive traffic lights, traffic signals may change the flow of traffic in accordance with the number of cars in each segment. This research focused on modelling based on the Unity3D platform employing fuzzy logic control and advocated the usage of an agent-based modelling system to regulate traffic light. Three different environments—busy, moderate, and smooth were used for the test. The average waiting time, system performance is measured by the average number of vehicle stops and the average vehicle speed. metrics. According to simulation data, adaptive traffic lights can enhance vehicle speed while decreasing waiting times and the number of cars that halt at intersections.

2.5 VISION-BASED ADAPTIVE TRAFFIC LIGHT CONTROLLER FOR SINGLE INTERSECTION

In this study, a vision-based adaptive traffic signal controller is proposed. The planned controller was successfully installed and tested as a whole system in a challenging Colombo roundabout at a time when traffic was at its worst. There were two main parts to its implementation. The first was a system for vision-based traffic monitoring. This section describes a system that employed cameras to keep an eye on the lanes at a junction. The video feeds were then processed to build a traffic index based on variables including vehicle type, traffic density, and pixel-wise vehicle velocity. The second component of the project was the controlling of traffic signal lights. In this section, we used a mathematical modelling technique to estimate a better time modification for the present system. For simple implementation in the actual world, this system was operated using the current system with few modifications. To adjust traffic signal phase timing in accordance with the volume of existing traffic, the produced prototype was connected into the existing system.

2.6 TRAFFIC FLOW PREDICTION FOR SMART TRAFFIC LIGHTS USING MACHINE LEARNING ALGORITHMS

Nowadays, many cities have traffic congestion during certain peak hours, which raises locals' exposure to pollution, noise, and stress. Neural networks (NN) and machine-learning (ML) approaches are more frequently used to address real-world problems than analytical and statistical approaches due to their ability to handle dynamic behaviour over time and with a variety of parameters in large amounts of data. This study proposes machine learning (ML) and deep learning (DL) algorithms for predicting traffic flow at an intersection, laying the groundwork for adaptive traffic control, either by applying an algorithm that modifies the timing of the traffic lights in accordance with the predicted flow or by remotely controlling traffic lights. Hence, forecasting traffic flow is the only goal of this effort. Two open datasets are used to train, validate, and test the suggested ML and DL models. The first one comprises a sample of all the vehicles collected over a period of 56 days at six intersections using different sensors. The Recurrent Neural Networks (RNNs), which had high metrics outcomes but took more training time, came in second, followed by Gradient Boosting, Recurrent Neural Networks, Linear Regression, and Stochastic Gradient, and lastly Random Forest, Linear

Regression, and Stochastic Gradient. Better results (R-Squared and EV score of 0.93) were obtained with the Multilayer Perceptron Neural Network (MLP-NN), which also needed less training time.

2.7 AN EDGE TRAFFIC FLOW DETECTION SCHEME BASED ON DEEP LEARNING IN AN INTELLIGENT TRANSPORTATION SYSTEM

Intelligent transport systems have a considerable influence on the management of public transit, security, and other issues (ITS). Sensing of traffic movement is a crucial part of the ITS. Based on the real-time data collection of information on urban road traffic flow, an ITS delivers intelligent recommendations for reducing environmental pollution and traffic congestion. Traffic flow detection is frequently done using cloud computing. The edge of the network will transmit all the captured video to the cloud computing facility. Nevertheless, due to the increasing traffic monitoring, conventional transport systems based on cloud computing have encountered major difficulties in terms of storage, connection, and processing .In this research, a deep learning-based edge node traffic flow detection approach is proposed as a remedy for this issue. The YOLOv3 (You Only Look Once) model, which has been extensively trained using traffic data, is the basis of the second approach we provide, which is for the detection of moving objects. We reduced the model to ensure its performance on modern hardware. The DeepSORT (Deep Simple Online and Real-time Tracking) technique is then optimized when the feature extractor is retrained for multi object vehicle tracking. Next, we describe a real-time vehicle tracking counter for autos that combines vehicle recognition and vehicle tracking algorithms to achieve the identification of traffic flow. In the end, we deploy and migrate the multiple objects tracking network and vehicle detection network onto the Jetson TX2 platform for edge devices, and we evaluate the precision and efficiency of our framework. The test results show that our model, with an average processing speed of 37.9 FPS (frames per second) and a processing speed of 92.0%, can accurately and successfully detect traffic flow on edge devices.

2.8 INTELLIGENT DRIVER DROWSINESS DETECTION FOR TRAFFIC SAFETY BASED ON MULTI CNN DEEP MODEL AND FACIAL SUBSAMPLING

According to statistics, sleepy, tired, or distracted driving is a major contributor to accidents on the world's highways. Several research on the issue of automated drowsiness detection propose to collect physiological data from the driver, such as the ECG, EEG, heart variability rate, blood pressure, etc., making those approaches subpar. Recent ones propose computer vision-based remedies, their performance is restricted since they either employ manually created features with traditional methods like Naive Bayes and SVM or too complex deep learning models that still perform poorly. As a result, In this paper, we provide an ensemble deep learning architecture that evaluates the driver's fitness using a decision structure and integrated attributes from mouth and eye subsamples. The proposed ensemble model consists of only two InceptionV3 modules, which help to constrain the parameter space of the network. These two modules independently and unilaterally perform feature extraction for the mouth and eyes subsamples from the face images. The output of each output is passed to the ensemble boundary using the weighted average technique, whose weights are modified by the ensemble process. The output of this system determines whether the driver is tired or not. The benchmark NTHU-DDD video dataset is used to effectively train and assess the suggested model. With train and validation accuracy of 99.65% and 98.5%, respectively, the model achieved accuracy on the evaluation dataset of 97.1%, which is substantially higher than that of previously recommended models.

2.9 A PERFORMANCE MODELING AND ANALYSIS OF A NOVEL VEHICULAR TRAFFIC FLOW PREDICTION SYSTEM USING A HYBRID MACHINE LEARNING-BASED MODEL

Recently, a lot of focus has been placed on the Intelligent Transportation System (ITS), which incorporates traffic prediction on the road. It's always a hot topic to figure out how to develop an accurate, efficient, and trustworthy system for anticipating automobile traffic. The employment of machine learning-based (ML) techniques, particularly deep learning-based (DL) approaches, increases the prediction model's accuracy. Nevertheless, we also noted that there are still a great deal of problems with the use of ML-based vehicular traffic forecast models in the actual world. First off, the training period for DL models is much longer than it is for parametric models like ARIMA and SARIMA. Not to mention, it's essential that we put the prediction system to use while simultaneously figuring out how to leverage the cutting-edge technology employed in ITS to improve the prediction system itself. In this article, we focus on improving the prediction model's characteristics so that it can be applied in real-world scenarios. A unique hybrid deep learning model is presented using the Graph Convolutional

Network (GCN) and the deep aggregation structure (i.e., the sequence-to-sequence structure) of Gated Recurrent Unit (GRU). To solve the real-world prediction issue, often known as the online prediction task, we present a unique online prediction approach based on refinement learning. To improve the model's accuracy and efficiency when employed with ITS, we apply a powerful parallel training approach and the vehicular cloud structure.

2.10 A SURVEY OF TRAFFIC PREDICTION: FROM SPATIO-TEMPORAL DATA TO INTELLIGENT TRANSPORTATION

Our trip is more convenient and effective thanks to intelligent transportation (such as an intelligent traffic light). It makes sense to collect spatio-temporal data and utilize it to promote the goal of intelligent mobility, where traffic prediction is vital, as mobile Internet and location technologies progress. We present a thorough overview of traffic prediction in this study, including everything from the spatiotemporal from the data layer to the application layer for intelligent transportation. Starting from the bottom and working our way up, we divided the entire study area into four sections: spatiotemporal data, preprocessing, traffic prediction, and traffic application. We then examine the previous research on the four sections. Second, based on variations in space and time, we divide traffic data into five types. We focus on four crucial data preparation techniques in the second section: map-matching, data cleaning, data storage, and data compression. Finally, we concentrate on the categorization, creation, and estimation/forecasting of three different traffic prediction issues. We list the issues and talk about how current approaches deal with them. Fifth, we provide a list of five common traffic applications. Finally, we offer recent research prospects and difficulties. We think that the survey can aid practitioners in comprehending the methodologies and issues associated with traffic prediction, which will further motivate them to develop their own intelligent transportation solutions.